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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,550	06/20/2003	Jonathan Michael Cohen	6641P001	6088

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EXAMINER

NGUYEN, KIMBINH T

ART UNIT	PAPER NUMBER
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2671

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/600,550	Applicant(s) COHEN, JONATHAN MICHAEL	
	Examiner Kimbinh T. Nguyen	Art Unit 2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-58 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 11, 13, 21, 24-31, 34, 35, 37, 45, 48-50 and 54-57 is/are rejected.
- 7) ☒ Claim(s) 8, 9, 12, 14-20, 22, 23, 32, 33, 36, 38-44, 46, 47, 53 and 58 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. Claims 1-58 are pending in the application.

Claim Objections

2. Claim 58 is objected to because of the following informalities: "The apparatus of claim 54" should be changed to --The system of claim 54--. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-7, 21, 24-31, 45, 48-50, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada U.S. Application No. US 2003/0128207 in view of Zhang et al. US 2003/0011596.

Claims 1, 49, Sawada discloses receiving a request to generate a color value of a point P with surface normal N (fig. 12; paragraphs 58, 59); and computing the color value for the point using an importance sampling estimator for a reflected radiance integral (estimating coloring information; illumination luminance distribution; paragraphs 50-57 page 4); Sawada does not teach selecting ray sample; however, Zhang teaches

where the importance sampling estimator selects a plurality of ray samples to generate the color value (Lambertian model; paragraph 63), and Sawada teaches where ray sample directions are chosen according to information obtained from at least a light source term and a bi-directional reflectance distribution function (BRDF) term of the reflected radiance integral (paragraphs 55-59). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the ray samples taught by Zhang into the method color estimating of Sawada for computing the color value, because the scattered light ray eventually reaches the object surface, and is reflected into the air in various directions. This phenomenon results in diffuse reflection (see paragraph 63).

Claims 4, 5, 28, 29, Sawada discloses the importance function approximates a product of the light source term and the BRDF term of the integrand of the reflected radiance integral (illumination luminance distribution; equation of paragraph 57); the importance function approximates a product of the light source term, the BRDF term, and the visibility term of the integrand of the reflected radiance integral (paragraphs 55-57).

Claims 21, 45, Sawada discloses computing, for each pixel within an environment map, a product of a BRDF term, evaluated in a direction corresponding to the pixel, times an environment map term evaluated in the direction corresponding to the pixel (paragraphs 55-57).

Claims 24, 48, Sawada discloses a contribution function that depends only on direction, such that the point P is lit by an environment map (paragraph 55).

Claims 2, 26, Sawada discloses generating an importance function for an integrand of the reflected radiance integral (a performance function may be set which takes into consideration the reliability of each of the values; paragraphs 57-62); and Zhang teaches selecting a plurality of ray samples on a unit hemisphere surrounding the point P with surface normal N according to the importance function (paragraph 15).

Claims 3, 27, Zhang discloses the importance sampling estimator selects the plurality of ray samples and ray sample directions according to information obtained from the based on a visibility term (global texture map), the BRDF term and the light source term of the reflected radiance integral (estimate reflectance parameter for the object's surface; paragraph 14).

Claims 6, 30, 50, 55, Zhang discloses partitioning a unit hemisphere surrounding the point P into M non-overlapping regions (individual illumination hemispheres; paragraphs 16, 71 -73); approximating a value of the integrand of the reflected radiance integral as a piece-wise constant function that is constant over each of the M non-overlapping regions (paragraph 76); and using this piece-wise constant approximated value as the importance function (paragraphs 77-87).

Claims 7, 31, Zhang discloses partitioning a hemisphere about the surface normal N into M non-overlapping regions (individual illumination hemispheres; paragraphs 16, 71 -73); computing a normalized weight of each non-overlapping region (paragraphs 76-89); and mapping points from a unit square into a unit hemisphere according to the normalized weight of the non-overlapping regions (paragraph 93).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the illumination hemisphere taught by Zhang into the method color estimating of Sawada for computing the color or intensity value, because it would reduce the data necessary to model the illumination distribution, paragraph 15).

Claim 25, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Zhang teaches a machine readable medium (paragraph 45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate machine readable medium taught by Zhang into the method color estimating of Sawada for computing the color or intensity value, because it would contain data and/or program modules that are immediately accessible to and/or presently being operated on by processing unit (paragraph 46).

Claim 54, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Zhang teaches a chipset (140, 150, 160, 170); a processor (120) coupled to the chipset via memory bus (121); and graphic logic coupled to the chipset (fig. 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a computer system taught by Zhang into the method color estimating of Sawada for computing the color or intensity value, because it would provide a system for implementing a suitable computing environment.

5. Claims 10, 11, 13, 34, 35, 37, 51, 52, 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada U.S. Application No. US 2003/0128207 in view of Zhang et al. US 2003/0011596 and further in view of Cabral et al. (6,697,062).

Claims 10, 34, 51, 56, Cabral et al. discloses tessellating an environment map sphere into M non-overlapping spherical triangles (col. 6, lines 3258; col. 7, lines 18-30; col. 13, lines 28-35); forming a hemisphere from the tessellated sphere about the surface normal N for the point P (col. 8, lines 60 through col. 9, line 7; fig. 2); generating a visible triangle list of the non-overlapping spherical triangles on the hemisphere (col. 13, lines 27-35); computing a normalized weight of each visible spherical triangle (col. 6, lines 43-62; col. 13, lines 17-55); and mapping points from a unit square onto triangles of the hemisphere according to a respective normalized weight of the triangles, such that the mapped points on the hemisphere are used as the selected ray samples (col. 10, lines 5-63).

Claims 11, 35, Cabral et al. discloses tessellating the environment map sphere further comprises: determining one or more triangles within the tessellated sphere having a variance above a predetermined value (col. 6, line 44-62; col. 13, lines 10-16); tessellating the one or more identified triangles into non-overlapping triangles (unit sphere); and repeating the identifying and tessellating until a predetermined number of spherical triangles are formed (col. 13, lines 9-35).

Claims 13, 37, 52, 57, Cabral et al. discloses tessellating a spherical environment map into M non-overlapping spherical triangles (col. 6, lines 3258; col. 7, lines 18-30; col. 13, lines 28-35); calculating a convolution of each spherical triangle against a surface BRDF (col. 10, lines 24-36); and storing each calculated convolution in a map (col. 9, lines 8-16).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate sphere environment map taught by Cabral into the method color estimating of Sawada for tessellating the environment map, because it would create a destination radiance environment map (abstract).

Allowable Subject Matter

6. Claims 8, 9, 12, 14-20, 22, 23, 32, 33, 36, 38-44, 46, 47, 53 and 58 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not teach dividing an interval into a plurality of sub-intervals according to the non-overlapping regions such that a length of each respective sub-interval is equal to a normalized weight of the non-overlapping region used to form the sub-interval; selecting a random point X,Y from a unit square; determining a sub-interval containing the X-component of the selected point; mapping the point to the unit square according to a length of the sub-interval; and mapping the point from the unit square to a non-overlapping region corresponding to the determined sub-interval. Selecting a direction to be used as a free parameter of the BRDF term; selecting a direction that is subtended by the selected spherical triangle; computing a product of a value of the

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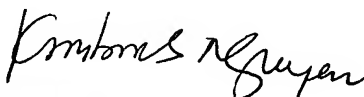
BRDF term for the selected free parameter direction times a value of the environment map in the selected direction from the spherical triangle.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimbinh T. Nguyen whose telephone number is (571) 272-7644. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Friday from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached at (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 16, 2005


KIMBINH T. NGUYEN
PRIMARY EXAMINER